DEPARTMENT OF
ECOLOGY
State of Washington

DRAFT TECHNICAL SUPPORT DOCUMENT FOR THE SGL AUTOMOTIVE CARBON FIBER FACILITY LINES 3–10 AUTHORIZING PSD 14-02 AND 14AQ-E586

Prepared by

Air Quality Program
Washington State Department of Ecology
Olympia, Washington

March 2, 2015

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. EXECUTIVE SUMMARY

Below is the Technical Support Document (TSD) for the SGL Automotive Carbon Fiber (SGLACF) facility Lines 3–10 Project. The Washington State Department of Ecology (Ecology) has determined that all regulatory requirements have been satisfied and the project complies with the requirements for New Source Review (NSR) in the state of Washington.

2. INTRODUCTION

This Technical Support Document (TSD) addresses all emissions from the Lines 3–10 Project. Two separate approvals are being issued for this facility. One for the pollutants subject to Prevention of Significant Deterioration (PSD) program and one for the pollutants subject to Ecology's minor NSR program.

The PSD permitting requirements in Washington State are established in Title 40, Code of Federal Regulations (CFR) §52.21; Washington Administrative Code (WAC) 173-400-700 through 750; and the agreement for the delegation of the federal PSD regulations by the United States Environmental Protection Agency (EPA) to Ecology dated December 10, 2013.

Federal and state rules require PSD review of all new or modified air pollution sources that meet certain criteria in an attainment or unclassifiable area with the National Ambient Air Quality Standards (NAAQS). The objective of the PSD program is to prevent significant adverse environmental impact from emissions into the atmosphere by a proposed new major source, or major modification to an existing major source. The program limits degradation of air quality to that which is not considered "significant." PSD rules require the utilization of Best Available Control Technology (BACT) for certain new or modified emission units, which is the most effective air pollution control equipment and procedures that are determined to be available after considering environmental, economic, and energy factors.

The PSD rules must be addressed when a company is adding a new emission unit or modifying an existing emission unit in an attainment or unclassifiable area. PSD rules apply to pollutants for which the area is classified as attainment or unclassifiable with the NAAQS. PSD rules are designed to keep an area with "good" air in compliance with the NAAQS. The distinctive requirements of PSD are BACT, air quality analysis (allowable increments and comparison with the NAAQS), and analysis of impacts of the project on visibility, vegetations, and soils.

Ecology's minor NSR program is similar to the PSD program but it may address criteria pollutants that are not emitted in quantities great enough to trigger PSD and includes all toxic air pollutants (TAPs).

3. THE PROJECT

3.1. The Site

SGLACF is proposing to modify their automotive carbon fiber facility that is currently located on 110 acres of land in the city of Moses Lake, Washington, in Grant County. The site is within a Class II area that is in attainment or unclassified with regard to all pollutants regulated by the NAAQS and state air quality standards. The physical address is 8781 Randolph Road NE in Moses Lake, Washington. The property borders Stratford Road NE to the west, Randolph Road NE to the east, and is approximately one-half mile east of the Grant County International Airport, Township 20 N Range 28 E Section 22. The bounding Universal Transverse Mercator coordinates are NAD83 Zone 11, 326705/5231086, 327498/5231054, 327488/5230395, 326697/5230457.

A map of the facility is shown in Figure 1 below. The building on the far left is administrative and warehouse, the building labeled Lines 1–2 and Lines 3-4 are existing structures and operational. The building labeled Lines 5–6 is under construction. The proposed new buildings are labeled New Warehouse, Lines 7–8, and Lines 9–10.

Figure 1. Facility Map

3.2. The Existing Facility

On March 23, 2010, SGLACF applied to install and operate two polyacrylonitrile (PAN) carbon fiber production lines. Each line had the capacity to produce up to 1,500 tons of carbon fiber per year. In order to stay below 100 tons per year (tpy) limit, SGLACF requested and received a federally enforceable limit of 99 tpy on nitrogen oxides (NO_X). Permit Number 10AQ-E362 was issued on July 13, 2010.

On January 31, 2011, SGLACF applied to install seven natural gas-fired reciprocating engines. Six of the engines were intended to provide power to safely shut down Line 1 should a grid power failure occur. The seventh engine was to provide power to an emergency power water pump for fire suppression. Permit Number 10AQ-E362 was rescinded and replaced by 11AQ-E408 on April 14, 2011.

On July 25, 2012, SGLACF applied to install and operate four natural gas-fired emergency power reciprocating engines. These engines were installed to provide emergency backup power to safely shut down Line 2. Permit Number 11AQ-E408 was rescinded and replaced by Permit Number 12AQ-E465 on February 21, 2013.

On June 28, 2013, SGLACF applied to double the size of the facility from two lines to four lines. Each of the four lines is designed to produce up to 1,760 tons of carbon fiber per year. In order to stay below the 100 tpy limit, SGLACF installed controls to ensure NO_X emissions would not exceed 100 tpy thus meeting their federally enforceable limit of 99 tpy on NO_X in the original permit. Permit Number 12AQ-E465 was rescinded and replaced by Permit Number 13AQ-E525 on January 24, 2014.

On March 26, 2014, SGLACF applied to change the emergency backup power for Lines 3 and 4 allowed in Permit Number 13AQ-E525 from natural gas internal combustion engines to diesel compression ignition engines. Permit number 14AQ-E558 issued on September 9, 2014.

On March 4, 2014, SGLACF submitted an application to increase the size of the facility from four lines to eight lines. The proposed Lines 5–8 Project was identical to Lines 1–4 Project authorized by Permit Number 13AQ-E525 with three exceptions. SGLACF proposed to generate backup emergency power from diesel engines instead of natural gas engines, furnace emissions are no longer routed through a selective catalytic reduction (SCR) control device due to plugging problems, and a new mode of operation (Standby Mode) has been requested. The furnace emissions are still routed through a thermal oxidizer (TO) but water injection is proposed to reduce the formation of NO_X. During the public comment period for the preliminary Order of Approval, EPA expressed its position that the approval process for Lines 5–8 should have been aggregated with the existing Approval Order. Under the terms of Settlement Agreement and Agreed Order No. 10768 signed June 16, 2014, Ecology acknowledged that Lines 1 and 2 were appropriately permitted as minor sources, and SGLACF agreed to submit new minor and major source permit applications addressing Lines 3–8, and the Lines 5–8 Project was never approved.

3.3. The Proposed Project

On August 15, 2014, SCLACF applied to increase the size of the facility to 10 lines. Each of the additional lines is expected to produce 1,760 tons of carbon fiber each year and include a regenerative thermal oxidizer (RTO) and a TO to combust organic compounds in the exhaust from the oxidation ovens and carbonization furnaces, respectively. An SCR will be installed on Lines 3–6 but is not proposed for Lines 7–10. Additionally, eight diesel-fuelled backup emergency power generators and a fire water pump engine will be installed.

There are six process steps associated with producing carbon fiber. They are:

1. Feed and Pretension: This step involves feeding carbon fibers from spools or bobbins through a series of rollers to apply uniform tension. There are no measurable emissions from the feed and pretension phase of production.

2. Oxidation: This step involves heating the fibers in electrically powered ovens up to a temperature of 200 to 300 degrees Celsius (°C). SGLACF indicated that it usually takes between four and five hours to complete the oxidization phase. Each line has four electrically powered ovens with two zones each.

3. Low-Temperature Carbonization: Each line has two electrically powered furnaces: one for low-temperature carbonization and one for high-temperature carbonization. Carbonization is the conversion of an organic substance into carbon. The fiber is fed into a furnace and heated to temperatures between 700° and 800°C in a nitrogen atmosphere. The material loses approximately 39 percent of its weight during this phase.

4. High-Temperature Carbonization: The fiber is then fed into a second furnace and is heated to temperatures between 1200° and 1300°C in a nitrogen atmosphere. When the fiber leaves this furnace, it has a carbon content of approximately 94 percent and is 10 to 12 percent lighter.

5. Surface Treatment: In this step, the surface of the fiber is treated by passing electricity through it. The fiber is treated as an anode in an electric cell which allows material to be bonded to the outside of the fiber. There are no measurable emissions from the sizing phase of production.

6. Sizing: A resin sizing coating is applied using a double-dip roller bath and squeegee. The fiber is treated with resin to improve handling and transportation and then dried by two steam drum rollers. There are no measurable emissions from the sizing phase of production.

7. Winding and Packaging: During this step, the finished carbon fiber is wound around cardboard spools and shrink-wrapped for shipment. There are no measurable emissions from the winding and packaging phase of production.

3.4. Operational Modes

Each line has six operational modes. Each mode is explained below.

3.4.1. Start-up Mode

Start-up Mode is defined as the period of time when the ovens are heating, but have not reached temperature and speeds necessary for Normal Mode. The oven temperatures and drive speeds follow start-up procedure. Heating the ovens to the recipe temperature is a critical process that is completed in several increments, typically over a five- to six-hour period. As the oxidation oven temperatures exceed 220^{o}C, the precursor (PAN) begins reacting and emissions are generated. This continues until Normal Operation Mode is achieved. During the oven heat up process, the partially oxidized carbon fibers from the ovens do not go through the furnaces for carbonization. These oxidized carbon fibers go into boxes as waste and are discarded as refuse. There are no restrictions on operation in this mode because emissions are less than Normal Operation Mode.

3.4.2. Normal Operation Mode

In the Normal Operation Mode, fans pull fumes from the four oxidation ovens and direct it to the RTO and an SCR unit for Lines 3–6, where the PAN oxidation reaction byproducts and NO_X are reduced before exhausting through the 115-foot main line stack. The RTO and SCR each have an associated natural gas preheater with a rated capacity of 8.4 MMBtu/hr and 4.6 MMBtu/hr, respectively. A second 8.4 MMBtu/hr heater may be used to heat the backup RTO catalyst bed. Emissions from the two furnaces are routed to a TO that uses water injection to reduce NO_X formation before exhausting through the main line stack. The TO has a 4 MMBtu/hr natural gas heater. Continuous Emission Rate Monitoring System (CERMS) are installed on each main line stack to measure NO_X emissions. During this mode, an online tube cleaner will operate to maintain clean heat transfer surfaces in the waste heat recovery boilers associated with each TO. Each line will be authorized to operate 8,760 hours per year in Normal Operation Mode and NO_X emissions will be monitored by a CERMS.

3.4.3. Shutdown Mode

Shutdown Mode is defined as the time from when the higher capacity exhaust fans come on until the oven temperatures are below 220^{o}C. Shutdown Mode occurs at the end of each production campaign to quickly cool down the fibers, about every 15 to 30 days. Shutdown consists of bringing ambient air into the ovens through large doors on the side of the ovens. At the same time that these doors are opened, the quick cool down doors are also opened and the quick cool down exhaust fan is started. The excess air from the ovens is directed through shutdown stacks located directly above each oven. The normal RTO exhaust system is also functional at this time and approximately 22 percent of the oven exhaust continues to pass through the RTO and the SCR (Lines 3–6). The remaining emissions are vented through the shutdown stack and NO_X emissions are not monitored by the CERMS. Quick cool down is activated to prevent or mitigate an oven fire or during normal shutdown to preserve the oxidation profile on the band which improves safety during restart.

During shutdown, emissions from the furnaces continue to be directed to the TO and exhaust through the main line stack.

This mode may also be utilized in an emergency situation, wherein a problem in oxidation could potentially result in an exothermic reaction (a fire) unless the quick cool down is implemented. Except in an emergency, no more than one line would be operated in quick cool down mode at the same time. SGLACF based potential emissions for each line operating in Shutdown Mode for 90 seconds each day of the year or 9.13 hours per year.

3.4.4. RTO Bypass Mode

SGLACF has requested authorization to bypass the RTO in the event of RTO malfunction. This mode is activated only in the rare event when the RTO has an equipment failure that renders it inoperable. The plant operators are alerted when the RTO shuts down, and they follow a prescribed procedure to determine if they can restart the RTO or if they need to safely shut down the line until the RTO can be repaired. The oven fumes must be vented to atmosphere while the shutdown is occurring. SGLACF based potential emissions for Lines 3–10 operating in RTO Bypass Mode for 1½ hr/day aggregate and each line operating in RTO Bypass Mode for a total of 4½ hours per year. Furnace emissions during RTO bypass will continue to be routed through the TO and pass directly to the main line stack. NO_X emissions from the main stack will continue to be measured by the CERMS.

3.4.5. SCR Bypass Mode

In the event that an SCR malfunctions or is bypassed, SGLACF may shut down the SCR. Lines 3–6 are equipped with SCR units; Lines 7–10 will not have SCR units. During SCR Bypass Mode, emissions from the ovens are routed through the RTO and either bypass the SCR directly into the main line stack, or continue to be routed through the SCR (when it is not functional) into the main line stack. Furnace emissions during SCR Bypass Mode will continue to be routed through the TO and pass directly to the main line stack. Furnace emissions are the same as in Normal Operation Mode. Operation in this mode is limited to 100 hours per year for each line. NO_X emissions from the main stack will continue to be measured by the CERMS. Only one line may operate in SCR Bypass Mode at a time.

3.4.6. Standby Mode

Standby Mode is when the TO and RTO are maintained at a normal operating temperature between campaigns. Between the end of one campaign and the start of the next campaign, the furnaces are kept warm due to the length of time necessary to achieve proper operating temperature. The furnaces are electrically heated and there are no furnace emissions during cleaning and maintenance periods at the end of a campaign. In addition, SGLACF may also operate the RTO burners at nominal capacity during Standby Mode to maintain the RTO ceramic brick near its operating temperature. The natural gas burner is the only source of emissions from the RTOs because PAN fiber is not being processed during this mode and the oxidation ovens are electrically heated. Emissions during this mode are from the TO and RTO natural gas-fired heaters (4 MMBtu/hr & (2) 8.6 MMBtu/hr, respectively). The SCR is not operational. There are no restrictions on operation in this mode.

3.4.7. Emergency Power Generation

SGLACF is proposing to install eight diesel-fuelled 2,937 brake horsepower (bhp) engines for quick cool down fans, lighting, and conveyor engines; one for each of the proposed four lines. Each of the eight emergency power generators (L3EG, L4EG, L5EG, L6EG, L7EG, L8EG, L9EG, and L10EG) is expected to operate no more than 16 hours in any 12-month rolling period. The 16 hours of operation are based upon four 2-hour reliability tests and one 8-hour emergency operational period. However, the permit will not differentiate between testing and emergency operation. It takes approximately 10 minutes to start-up the CO, NO_X, and VOC control equipment (SCR). Therefore, the engines will be in Start-up Mode approximately one hour per year and in normal operation the other 15 hours per year. In addition, the permit requires performance testing of a representative engine within 12 months of start-up and every five years thereafter. Therefore, annual engine emissions calculations account for a single engine to operate for one 8-hour performance test in addition to the 16 hours per year discussed above.

SGLACF will also install one natural gas-fuelled fire water pump (FWP2). The spark ignition engine generating electricity to run the fire water pump is expected to operate 38 hours each year. This will include weekly 30-minute readiness tests, one 4-hour annual test, and eight hours of emergency operation. However, the permit will not differentiate between testing and emergency operation.

4. LAWS AND RULES

Washington operates its PSD program under a delegation agreement from EPA Region 10, dated December 10, 2013. Additionally, Ecology has its own PSD program codified in WAC 173-400-700 through 750. Ecology follows all EPA guidance when issuing PSD permits.

The Washington State Clean Air Act codified in Chapter 70.94 RCW grants Ecology the authority to issue NSR Orders of Approval. The implementing regulation, Chapter 173-400 WAC, describes a set of procedures to use when performing NSR. The majority of the requirements are contained in, but not limited to, WAC 173-400-091, WAC 173-400-110, WAC 173-400-111, WAC 173-400-113, and WAC 173-400-114. There are several general requirements or emission standards that apply to this source. One emission standard is a grain loading standard from combustion units of 0.1 grains/dry standard cubic foot (g/dscf) (see WAC 173-400-050(1)). There is also a maximum opacity standard of 20 percent listed in WAC 173-400-040(1).

4.1. WAC 173-400-110

This section of the rule addresses applicability of NSR to new and modified sources. Lines 3–10 are new emission units and this section of the rule describes the procedures for processing a Notice of Construction (NOC) application.

4.2. WAC 173-400-113

This section of the rule requires a proposed source of modification in an attainment or unclassifiable area to comply with the federal rules, employ BACT for new or modified units, and ensure that the project does not cause or contribute to a violation of ambient air quality standards.

4.3. New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP)

NSPS applies to certain types of equipment that are newly constructed, modified, or reconstructed after a given applicability date. NESHAP applies to categories of equipment with hazardous air pollutant (HAP) emissions. The applicability of the following NSPS and NESHAPs are presented below:

- New Source Performance Standard 40 CFR 60, Subpart A
- New Source Performance Standard 40 CFR 60, Subpart IIII
- New Source Performance Standard 40 CFR 60, Subpart JJJJ
- National Emission Standards for Hazardous Air Pollutants 40 CFR 63, Subpart A
- National Emission Standards for Hazardous Air Pollutants 40 CFR 63, Subpart FFFF
- National Emission Standards for Hazardous Air Pollutants 40 CFR 63, Subpart ZZZZ

4.3.1. NSPS

4.3.1.1. NSPS Subpart A (General Provisions)

40 CFR 60.1 through 60.19, otherwise known as Subpart A, sets forth the general provisions that a stationary source must comply with. Most notable are the notification, monitoring, and performance testing requirements.

4.3.1.2. NSPS Subpart IIII (Standards of Performance for Compression Ignition Internal Combustion Engines)

40 CFR 60.4200 through 60.4219, otherwise known as Subpart IIII, sets forth standards that owners and operators of stationary compression ignition engines must comply with. Including non-emergency engines, emergency (non-fire pump) engines, emergency (fire pump) engines, and reconstructed engines. In order to be considered emergency engines per Subpart IIII, the engines must operate in accordance to the following requirements as specified in Section 60.4211(f).

There are several other provisions that allow for additional use of the emergency engines but SGLACF proposed using their Reciprocating Internal Combustion Engines (RICE) only for readiness testing, during power outages and emergencies, and for performance testing due to permit requirements.

Pursuant to Sections 60.4205(b), 60.4202(a)(2), and 60.4211(c), SGLACF must comply with the subpart by purchasing engines certified to the applicable emission standards in Table 1 copied from 40 CFR 89.112 below:

Table 1. Subpart IIII Emission Standards

Rated Power (kW)	Tier	Model Year	Emission Standards g/kW-hr		
			$NMHC+NO_X$	CO	PM
kW > 560	Tier 2	2006	6.4	3.5	0.2

Additionally, SGLACF must use diesel fuel with a sulfur content of 15 ppm maximum and a maximum cetane index of 40 or aromatic content of 35 volume percent.

SGLACF will comply with the subpart by installing certified engines that at least meet the emission standards listed above. The engines must be installed with a non-resettable hour meter and a backpressure monitor that notifies the operator when the high backpressure limit of the engine is approached. SGLACF will operate and maintain the engines according to the manufacturer's emission-related written instructions, and will keep records of the engine certification, hours of emergency and non-emergency operation, and any corrective action taken after the backpressure monitor has notified the operator that the high backpressure limit of the engine was approached. No performance testing, notification, or reporting is required for these units by Subpart IIII.

4.3.1.3. NSPS Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines)

40 CFR 60.4230 through 60.4248, otherwise known as Subpart A, sets forth the general provisions that manufacturers, owners, and operators of spark ignition internal combustion engines must comply with. SGLACF proposes to install one natural gas-fired reciprocating engine to power a firewater pump for fire suppression. The reciprocating engine is subject to Subpart JJJJ because it is an emergency engine that will be manufactured after January 1, 2009.

The emission standards are listed in Table 2.

Table 2. Subpart JJJJ Emission Standards

Engine Type and Fuel	Maximum Power	Emission Standards g/HP-hr			Emission Standards ppmvd @15% O_2		
		NO_X	CO	VOC	NO_X	CO	VOC
Emergency, Natural Gas	>130 HP	2	4	1	160	540	86

SGLACF will comply with the subpart by installing a certified engine that meet the emissions standards listed above. SGL ACF will operate and maintain the engine according to the manufacturer's emission-related written instructions, and will keep records of the engine certification and conducted maintenance to demonstrate compliance. No performance testing, notification, or reporting is required by Subpart JJJJ.

4.4. NESHAP

4.4.1. NESHAP Subpart A (General Provisions)

The provisions of Subpart A apply to each affected facility under any Part 63 NESHAP rule. Subpart A contains general requirements for notifications, monitoring, performance testing, reporting, recordkeeping, and operation and maintenance. These general requirements will apply to the proposed project as referenced in the applicable NESHAP subparts.

4.4.2. NESHAP Subpart FFFF (NESHAP for Miscellaneous Organic Chemical Manufacturing)

40 CFR 63.2430 through 40 CFR 63.550, otherwise known as Subpart FFFF, applies to Miscellaneous Organic Chemical Manufacturing Process Units (MCPU) that are located at, or are part of, a major source of HAPs. An MCPU includes equipment necessary to operate a miscellaneous organic chemical manufacturing process.

In order to be subject to Subpart FFFF, the MCPU must process, use, or generate any of the organic HAPs listed in Section 112(b) of the CAA or hydrogen halide and halogen HAP, and must not be subject to another subpart under 40 CFR Part 63. Additionally, the MCPU must produce material or family of materials described by the following:

- An organic chemical(s) classified using the 1987 version of SIC code 282, 283, 284, 285, 286, 287, 289, or 386, except as provided in paragraph (c)(5) of this section.
- An organic chemical(s) classified using the 1997 version of NAICS code 325, except as provided in paragraph (c)(5) of this section.
- Quaternary ammonium compounds and ammonium sulfate produced with caprolactam.
- Hydrazine.
- Organic solvents classified in any of the SIC or NAICS codes listed in paragraph (b)(1)(i) or (ii) of this section that are recovered using non-dedicated solvent recovery operations.

The provisions of Subpart FFFF apply to MCPU. SGLACF questioned the analysis of whether the oxidation and carbonization of PAN fiber into carbon fiber met the definition of an MCPU. Nevertheless, they analyzed the rule as it applies to new sources.

Subpart FFFF requires pollution prevention through product recovery from process vents. SGLACF performed a Total Resource Effectiveness (TRE) analysis of the total organic HAPs from the ovens and furnaces. SGLACF presented the following analysis of the TRE as presented in Table 3.

Table 3. TRE Index				
	TRE Index Value			
Unit	Flare	Thermal Incinerator 0% Heat Recovery	Thermal Incinerator 70% Heat Recovery	Lowest Calculated TRE Value
Furnaces	54	12	9.5	9.5
Ovens	1458	254	55	55

The lowest calculated TRE index values for the two continuous process vents are above the NESHAP Subpart FFFF threshold value of five. Therefore, there are no substantive portions of this NESHAP that apply to this project.

4.4.3. NESHAP Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines)

40 CFR 63.6580 through 63.6675, otherwise known as Subpart ZZZZ, sets forth emission standards for stationary RICE located at major and area sources of HAP emissions.

The diesel-fired reciprocating engines proposed to operate oven fans in case of a grid power failure are considered new RICE located at a major source under this regulation because the engines will be constructed after December 19, 2002. The natural gas-fired reciprocating engine proposed to power a fire water pump for fire suppression is considered new RICE located at a major source under this regulation because the engine will be constructed after June 12, 2006.

5. EMISSIONS

WAC 1730400-030 (53) defines “New Source” as:

(a) The construction or modification of a stationary source that increases the amount of any air contaminant emitted by such source or that results in the emission of any air contaminant not previously emitted; and
(b) Any other project that constitutes a new source under the Federal Clean Air Act.

Ecology uses the formula potential minus actual (in tpy) to determine if a source has undergone an emissions increase and would be subject to NSR.

Potential emissions or a sources “potential to emit” are defined by WAC 173-400-030(73), where “potential to emit” means the maximum capacity of a source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design only if the limitation or the effect it would have on emissions is enforceable. Secondary emissions do not count in determining the potential to emit of a source.

Actual emissions are defined in WAC 173-400-030(1) where "actual emissions" means the actual rate of emissions of a pollutant from an emission unit, as determined in accordance with (a) through (c) of this subsection.

(a) In general, actual emissions as of a particular date shall equal the average rate, in tpy, at which the emissions unit actually emitted the pollutant during a two-year period which precedes the particular date and which is representative of normal source operation. Ecology or an authority shall allow the use of a different time period upon a determination that it is more representative of normal source operation. Actual emissions shall be calculated using the emissions unit's actual operating hours, production rates, and types of materials processed, stored, or combusted during the selected time period.

(b) Ecology or an authority may presume that source-specific allowable emissions for the unit are equivalent to the actual emissions of the emissions unit.

(c) For any emissions unit which has not begun normal operations on the particular date, actual emissions shall equal the potential to emit of the emissions unit on that date.

For this approval, potential minus actual will be used to determine the emissions increase. For the emission units that have begun normal operation, actual emissions will be set as zero.

5.1. Existing Allowable Emissions

For this project, Lines 3–10 will be treated as a brand new facility. Potential emissions will be used to represent all emissions from Lines 3–10. For this analysis, emissions from Lines 1 and 2 will not be included nor counted. See Order 14AQ-E586.

5.2. Proposed Emissions

Table 4 presents the facility's criteria pollutant emissions after the project.

Table 4. Proposed Emissions

Pollutant	Proposed Emissions (tpy)
CO	46
NO_X	467
PM (filterable)	39
$PM_{10}/PM_{2.5}$	88
SO_2	25
VOC	60

Table 5 presents the facility's TAP emissions after the project.

Table 5. TAP Emissions		
Pollutant	Averaging Period	Proposed Emissions (lb/avg. period)
NO_2	1-hr	84.5
CO	1-hr	23.6
SO_2	1-hr	5.6
Acetalydehyde	annual	0.47
Acrolein	24-hr	0.048
Acrylonitrile	annual	408.5
Ammonia	24-hr	594
Ammonium sulfate	1-hr	12
Ammonium bisulfate	1-hr	12
Arsenic	annual	0.26
Benzene	annual	14.23
Beryllium	annual	1.5E-02
Bromomethane	24-hr	3.5E-02
1,3-Butadiene	annual	0.11
Cadmium	annual	1.47
Carbon disulfide	24-hr	0.52
Chloromethane	lb/day	1.19E-02
Chromium VI	annual	7.0E-02
Cobalt	24-hr	3.07E-04
Copper	1-hr	1.28E-04
DEEP	annual	5.74
Dichlorobenzene	annual	1.54
Dichloromethane	annual	4.14E-02
Formaldehyde	annual	101.6
Hexane	day	5.38
Hydrogen cyanide	24-hr	316.5
Manganese	24-hr	1.36E-03
Mercury	24-hr	9.41E-04
Naphthalene	annual	1.15
Nickel	annual	2.73
Propylene	24-hr	1.30
Selenium	24-hr	8.64E-05
Toluene	24-hr	0.198
Vanadium	24-hr	8.26E-03

Table 5. TAP Emissions		
Pollutant	Averaging Period	Proposed Emissions (lb/avg. period)
Vinyl acetate	24-hr	0.98
Benz(a)anthracene	annual	4.00E-03
Benzo(a)pyrene	annual	2.21E-03
Benzo(b)fluoranthene	annual	5.28E-03
Benzo(k)fluoranthene	annual	2.95E-03
Chrysene	annual	6.37E-03
Dibenzo(a,h)anthrancene	annual	2.45E-03
Indeno(1,2,3-cd)pyrene	annual	1.35E-02
3-Methylcholanthrene	annual	2.38E-03
7,12-Dimethylbenz[a]anthracene	annual	2.60E-02

Table 6 presents the facility's greenhouse gas (GHG) emissions.

Table 6. GHG Emissions					
Pollutant	Lines 3–6	Lines 7–10	Generators	FWP	Total
CO_2e	28858	28858	213	8.8	57939

5.3. Operational Limitations

SGLACF has estimated its operational hours in each mode. Those limits are:

- RTO Bypass Mode limited to aggregate 1½ hours per day for Lines 3–10 and 4½ hours per line per year.
- Shutdown Mode will be limited to 365 ninety-second events per year for a total of 9.13 hours for each line.
- SCR Bypass Mode limited to 100 hours per year for each line.
- Operation of the eight 2,937 bhp emergency generators is limited to aggregate 136 hours of operation per year. The 136 hours of operation is expected to consist of eight hours of maintenance and testing and eight hours of emergency operation, per engine, as well as an additional eight hours per year for performance/source testing of one representative engine. The approval however will not restrict how the engines are operated only the total hours of operation.

- Operation of the fire water pump engine is limited to 38 hours per year. Originally, there was a plan to use 30 hours for maintenance and testing and eight hours per year for emergency operation, but there will be no restriction on how the fire water pump engine is operated, just the total hours of operation.

5.4. Emissions Increase

This authorization addresses emissions from Lines 3–10. All emissions are considered new and therefore subject to NSR.

5.5. Adequacy of Emission Factors

Table 7 present the project's line emission factors.

Table 7. Line Emission Factors

Pollutant	Avg. Period	Normal Operation Lines 3–6 lb/avg. period	Normal Operation Lines 7–10 lb/avg. period	SCR Bypass lb/avg. period	RTO Bypass lb/avg. period	Shutdown Lines 3–6 lb/avg. period	Shutdown Lines 7–10 lb/avg. period	Standby Lines 1–10 lb/avg. period
CO	1-hr	1.3	1.3	1.3	9.3	7.5	7.5	0.44
NO_X[1]	1-hr	8.5	17.9	17.9	8.5	8.5	17.9	0.69
PM	1-hr	1.1	1.1	1.1	1.1	1.1	1.1	0.015
$PM_{10}/PM_{2.5}$	1-hr	3	2	2	2	3	2	0.06
SO_2	1-hr	0.7	0.7	0.7	0.7	0.7	0.7	4.75E-03
VOC	1-hr	1.7	1.7	1.7	8.6	7.1	7.1	0.04
NO_2	1-hr	6.8	14.32	14.32	6.8	6.8	14.32	0.69
Acrolein	24-hr	0	0	0	0	0	0	0
Acrylonitrile	annual	5.60E-03	5.60E-03	5.60E-03	0.17	0.136	0.136	0
Ammonium sulfate[3]	1-hr	3	0	0	0	3	0	0
Ammonium bisulfate[4]	1-hr	3	0	0	0	3	0	0
Ammonia	24-hr	3	3	0.6	9.6	10	10	0
Arsenic	annual	3.70E-06	3.70E-06	3.70E-06	3.70E-06	3.70E-06	3.70E-06	1.58E-06
Benzene	annual	1.70E-04	1.70E-04	1.70E-04	1.70E-04	1.70E-04	1.70E-04	1.66E-05
Beryllium	annual	2.20E-07	2.20E-07	2.20E-07	2.20E-07	2.20E-07	2.20E-07	9.51E-08
Bromomethane	24-hr	1.80E-04	1.80E-04	1.80E-04	1.80E-04	1.80E-04	1.80E-04	0
1,3-Butadiene	annual	0	0	0	0	0	0	0
Cadmium	annual	2.10E-05	2.10E-05	2.10E-05	2.10E-05	2.10E-05	2.10E-05	8.71E-06
Carbon disulfide	24-hr	2.70E-03	2.70E-03	2.70E-03	2.60E-03	2.70E-03	2.70E-03	0
Chloromethane	24-hr	6.20E-05	6.20E-05	6.20E-05	6.20E-05	6.20E-05	6.20E-05	0
Chromium VI	annual	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	1.00E-06	4.44E-07
Cobalt	24-hr	1.60E-06	1.60E-06	1.60E-06	1.60E-06	1.60E-06	1.60E-06	6.65E-07
Copper	1-hr	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05	6.73E-06
DEEP	annual	0	0	0	0	0	0	0
Dichlorobenzene	annual	2.20E-05	2.20E-05	2.20E-05	2.20E-05	2.20E-05	2.20E-05	9.51E-06
Dichloromethane	annual	5.90E-07	5.90E-07	5.90E-07	5.90E-07	5.90E-07	5.90E-07	0
Formaldehyde	annual	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	5.94E-04
Hexane	24-hr	2.80E-02	2.80E-02	2.80E-02	2.80E-02	2.80E-02	2.80E-02	1.43E-02
Hydrogen cyanide	24-hr	1.4	1.4	1.4	30	24	24	0
Manganese	24-hr	7.10E-06	7.10E-06	7.10E-06	7.10E-06	7.10E-06	7.10E-06	3.01E-06
Mercury	24-hr	4.90E-06	4.90E-06	4.90E-06	4.90E-06	4.90E-06	4.90E-06	2.06E-06

Table 7. Line Emission Factors								
Pollutant	Avg. Period	Normal Operation Lines 3–6 lb/avg. period	Normal Operation Lines 7–10 lb/avg. period	SCR Bypass lb/avg. period	RTO Bypass lb/avg. period	Shutdown Lines 3–6 lb/avg. period	Shutdown Lines 7–10 lb/avg. period	Standby Lines 1–10 lb/avg. period
Naphthalene	annual	1.10E-05	1.10E-05	1.10E-05	1.10E-05	1.10E-05	1.10E-05	4.83E-06
Nickel	annual	3.90E-05	3.90E-05	3.90E-05	3.90E-05	3.90E-05	3.90E-05	1.66E-05
Propylene	24-hr	1.10E-04	1.10E-04	1.10E-04	1.10E-04	1.10E-04	1.10E-04	0
Selenium	24-hr	4.50E-07	4.50E-07	4.50E-07	4.50E-07	4.50E-07	4.50E-07	1.90E-07
Toluene	24-hr	2.60E-04	2.60E-04	2.60E-04	2.60E-04	2.60E-04	2.60E-04	2.69E-05
Vanadium	24-hr	4.30E-05	4.30E-05	4.30E-05	4.30E-05	4.30E-05	4.30E-05	1.82E-05
Vinyl acetate	24-hr	5.10E-03	5.10E-03	5.10E-03	4.90E-03	5.00E-03	5.00E-03	0
Benz(a)anthracene	annual	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	1.43E-08
Benzo(a)pyrene	annual	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08	9.51E-05
Benzo(b)fluoranthene	annual	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	1.43E-08
Benzo(k)fluoranthene	annual	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	1.43E-08
Chrysene	annual	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	1.43E-08
Dibenzo(a,h)anthrancene	annual	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08	9.51E-09
Indeno(1,2,3-cd)pyrene	annual	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	1.43E-08
3-Methylcholanthrene	annual	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	3.40E-08	1.43E-08
7,12-Dimethylbenz[a]anthracene	annual	3.00E-07	3.00E-07	3.00E-07	3.00E-07	3.00E-07	3.00E-07	1.27E-07

Table 8 presents the project's engine emission factors.

Table 8. Engine Emission Factors			
Pollutant	Avg. Period	Engines lb/avg. period	FWP lb/avg. period
CO	1-hr	0.6	4
NO_X	1-hr	5	2
PM	1-hr	0.05	0.04
$PM_{10}/PM_{2.5}$	1-hr	0.05	0.08
SO_2	1-hr	0.04	0.002
VOC	1-hr	0.4	1
NO_2	1-hr	4	1.6
Acrolein	24-hr	1.50E-04	0.01
Benzene	annual	1.50E-02	6.60E-03
1,3-Butadiene	annual	0	2.80E-03
DEEP	annual	4.50E-02	0
Dichloromethane	annual	0	1.70E-04
Formaldehyde	annual	1.50E-03	8.60E-02
Naphthalene	annual	2.70E-03	4.10E-04
Propylene	24-hr	5.40E-02	0
Toluene	24-hr	5.40E-03	2.30E-03
Benz(a)anthracene	annual	1.20E-05	0
Benzo(a)pyrene	annual	4.90E-06	0
Benzo(b)fluoranthene	annual	2.10E-05	0

Table 8. Engine Emission Factors			
Pollutant	**Avg. Period**	**Engines lb/avg. period**	**FWP lb/avg. period**
Benzo(k)fluoranthene	annual	4.20E-06	0
Chrysene	annual	2.90E-05	0
Dibenzo(a,h)anthrancene	annual	6.60E-06	0
Indeno(1,2,3-cd)pyrene	annual	7.90E-06	0

6. NSR APPLICABILITY

NSR applicability is an analysis of what requirements and what pre-construction permits apply to a new or modified source. Sources or emission units that are listed in WAC 173-400-110(4) are categorically exempt from NSR. Another exemption is for its emissions increase to be below the numerical limits contained in WAC 173-400-110(5). If a source cannot be exempt from the categorical list or the numerical list, they must undergo NSR.

The next evaluation is a comparison of sources' emissions to the major source thresholds. For Title V purposes, the threshold is 100 tons of a criteria pollutant, 10 tons of any HAP, or 25 tons of any combination of a HAP. If the project has the potential to emit more than 100 tons of criteria air pollutants, it would also be subject to PSD review as required under 40 CFR 52.21(b)(1)(i)(a) that would make this a 100 tpy PSD source.

If a source has potential emissions high enough to exceed the major source thresholds, but is willing to accept a federally enforceable limit, they may be eligible to receive a permit limit or regulatory order to avoid major NSR.

6.1. The Application

The pre-application meeting for this project was held on July 2, 2014. The NOC application, PSD application, and application for Lines 1 and 2 were submitted on August 15, 2014. The application was determined to be complete on September 15, 2014, additional information was received on December 1, 2014, February 23, 2015, and February 24, 2015. This TSD and Order of Approval are based upon the information submitted by the applicant, SGLACF, and its consultant, ENVIRON.

6.2. HAPs

Emissions of HCN exceed the 10 tpy major source threshold, which requires a facility-wide air operating permit. The emissions are greater than the exemptions contained in WAC 173-400-110(4) or (5) for most pollutants and the emission units themselves are not on the categorical exemption list.

6.3. PSD

SGLACF is a source that must evaluate PSD applicability based on the emissions threshold of 100 tpy or more of a regulated pollutant rather than 250 tpy or more of a regulated pollutant. It is subject to PSD because:

- SGLACF is one of the 28-listed industries that becomes a "major stationary source" when emitting more than 100 tpy of any regulated pollutant. If any one pollutant were emitted in quantities greater than 100 tpy, the project would be subject to PSD review.
- Proposed emissions of NO_X from the stationary source are greater than 100 tpy.
- Proposed emissions of PM, PM_{10}, NO_X, and VOC, exceed the PSD "Significant Emission Rate" (SER) of 25, 15, 40, 40, and 40 tpy, respectfully.
- In the June 16, 2014, Settlement Agreement, SGLACF agreed to apply for a PSD permit for Lines 3–8.
- The site of the proposed project is in an area that has been designated as in attainment or unclassifiable with national and state ambient air quality standards.

Table 9 shows which pollutants are subject to PSD review.

Table 9. PSD Applicability

Pollutant	Annual Emissions (tpy)	PSD SER (tpy)	Subject to PSD Review (Yes or No?)
NO_X	467	40	Yes
CO	46	100	No
PM	39	25	Yes
PM_{10}	88	15	Yes
$PM_{2.5}$	88	10	Yes
VOC	60	40	Yes
SO_2	25	40	No
GHGs	57939	75000	No

7. DETERMINATION OF BACT

BACT means an emission limitation based on the maximum degree of reduction for each air pollutant subject to regulation under Chapter 70.94 RCW emitted from or which results from any new or modified stationary source, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant. In no event shall application of the "best available control technology" result in emissions of any pollutants which will exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. Emissions from any source utilizing clean fuels, or any other means, to comply with this paragraph shall not be allowed to increase above levels that would have been required under the definition of BACT in the Federal Clean Air Act as it existed prior to enactment of the Clean Air Act Amendments of 1990.

This BACT analysis is consistent with general EPA guidance (EPA, 1990). The steps involved are briefly described below. The EPA BACT guidance document details a "top-down" approach for selecting the appropriate control technology. The steps are as follows:

Step 1. Identify all available control alternatives with practical potential for application to the specific emission unit for the regulated pollutant under evaluation.

Step 2. Eliminate all technically infeasible alternatives. If any of the control techniques identified in Step 1 cannot be successfully used on the emission units due to technical difficulties, such techniques are removed from further consideration.

Step 3. Rank the remaining alternatives by control effectiveness. Assess the performance of each technically feasible control technique, and rank them beginning with the most effective.

Step 4. Evaluate the cost-effectiveness, energy impacts, and environmental impacts of the most cost-effective control alternative.

Step 5. Select BACT, which will be the most effective alternative not rejected based on economic, energy, and/or environmental impacts.

7.1. Regulatory Requirements

BACT is required at each emission point for each pollutant subject to regulation. There are few examples of facilities that produce carbon fibers because very few facilities use electric-heated furnaces. Therefore, this plant is somewhat unique and Ecology was unable to identify any identical facilities emitting the same pollutants from the same design of process units as proposed by SGLACF.

7.2. Clearinghouse Review

ENVIRON queried EPA's Reasonably Available Control Technology (RACT)/BACT/Lowest Achievable Control Technology (LAER) Clearinghouse (RBLC) database for recent BACT determinations involving similar emission units. This initial broad search was refined by eliminating sources that did not have similar designs and that did not operate in a similar manner. The California Air Resources Board (CARB) BACT Clearinghouse was also searched for relevant permits, either pending or issued. In addition, the BACT workbooks and websites maintained by the Bay Area Air Quality Management District (BAAQMD), the South Coast Air Quality Management District (SCAQMD), the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), and the Texas Commission on Environmental Quality (TCEQ) were reviewed. Similar facilities located in the U.S. were identified by the facility, and the permits and statements of basis were reviewed. The sections that follow discuss the control technologies available and, ultimately, the selection of BACT for each emission unit and pollutant. The identified facilities are presented in Table 10.

Table 10. Carbon Fiber Companies

Facility	Location	Permit Date
Cytec	Rock Hill, SC	02/15/2012
	Greenville, SC	07/07/2008
Grafil	Sacramento, CA	07/05/2012
Hexcel	West Valley City, UT	09/01/2010
SGL Carbon	Evanston, WY	07/28/2008
SGLACF	Moses Lake, WA	02/21/2013
Toho Tenax	Rockwood, TN	03/16/2012
Toray Industries	Decatur, AL	07/31/1997
Zoltek Corp.	St. Charles, MO	1991 & 1997
	Abilene, TX	02/16/2010

Table 11 presents the RBLC results for VOC and CO.

Table 11. RBLC Results for VOC and CO

Facility	Location	Emission Unit	VOC			CO		
			Limit	Units	Control	Limit	Units	Control
Cytec	Rock Hill, SC	Oxidation ovens	100	tpy	None	None	N/A	None
		Pre-carb & carbonization ovens	100	Tpy	TO	None	N/A	None
	Greenville, SC	Carbon Fiber Line 1	None	N/A	Boiler	None	N/A	None
		Carbon Fiber Line 2	None	N/A	Boiler	None	N/A	None
Grafil	Sacramento, CA	Process Lines 31 & 32	3.34	lb/hr	TO	21.0	lb/hr	None
Hexcel	West Valley City, UT	Production Lines 13 & 14	159.57	Tpy	RTO/TO	None	N/A	None
SGL Carbon	Evanston, WY	Line 2 oxidation ovens	1.1	lb/hr	RTO	8.6	lb/hr	None
		Line 2 carbonization furnaces	0.5	lb/hr	TO	0.6	lb/hr	None
	Moses Lake, WA	Oxidation oven	0.01	lb/hr	RTO	0.11	lb/hr	RTO
		Carbonization furnaces	1.42	lb/hr	TO	0.385	lb/hr	TO
Toho Tenax	Rockwood, TN	Process Lines 3 & 4	14.8	lb/hr	RTO	1.43	lb/hr	RTO
Toray Industries	Decatur, AL	Mfg Process CFA-1 & CFA-2	None	N/A	TO	None	N/A	None

Table 11. RBLC Results for VOC and CO								
			VOC			CO		
Facility	Location	Emission Unit	Limit	Units	Control	Limit	Units	Control
Zoltek Corp.	St. Charles, MO	Oxidation oven	0.69	lb/hr	RTO	0.6	lb/hr	GCP
	Abilene, TX	Low- & high-temperature furnaces	2.5	lb/hr	TO	0.3	lb/hr	None

Table 12 presents the RBLC results for PM and SO_2.

Table 12. RBLC Results for PM and SO_2								
			PM			SO_2		
Facility	Location	Emission Unit	Limit	Units	Control	Limit	Units	Control
Cytec	Rock Hill, SC	Oxidation ovens	2.92	lb/hr	None	None	N/A	None
		Pre-carb & carbonization ovens	0.6	lb/MMBtu	TO	3.5	lb/MMBtu	None
	Greenville, SC	Carbon Fiber Line 1	0.5	lb/MMBtu	None	None	N/A	None
		Carbon Fiber Line 2	None	N/A	None	None	N/A	None
Grafil	Sacramento, CA	Process Lines 31 & 32	5.2	lb/hr	Baghouse	5.994	lb/hr	None
Hexcel	West Valley City, UT	Production Lines 13 & 14	None	N/A	Baghouse	None	N/A	None
SGL Carbon	Evanston, WY	Line 2 oxidation ovens	None	N/A	None	None	N/A	None
		Line 2 carbonization furnaces	None	N/A	None	None	N/A	None
	Moses Lake, WA	Oxidation oven	4.7	lb/hr	Proper operation	0.68	lb/hr	RTO
		Carbonization furnaces	0.23	lb/hr	Proper operation	None	N/A	TO
Toho Tenax	Rockwood, TN	Process Lines 3 & 4	3.17	lb/hr	None	2.07	lb/hr	RTO
Toray Industries	Decatur, AL	Mfg Process CFA-1 & CFA-2	0.22	gr/dscf	None	None	N/A	None
Zoltek Corp.	St. Charles, MO	Oxidation oven	0.45	lb/hr	GCP	0.10	lb/hr	GCP
	Abilene, TX	Low- & high-temperature furnaces	0.72	lb/hr	None	None	N/A	None

Table 13 presents the RBLC results for NO_X and HCN.

Table 13. RBLC Results for NO_X and HCN								
Facility	**Location**	**Emission Unit**	**NO_X Limit**	**NO_X Units**	**NO_X Control**	**HCN Limit**	**HCN Units**	**HCN Control**
Cytec	Rock Hill, SC	Oxidation ovens	None	N/A	None	None	N/A	None
		Pre-carb & carbonization ovens	None	N/A	TO	None	N/A	TO
	Greenville, SC	Carbon Fiber Line 1	None	N/A	None	None	N/A	Boiler
		Carbon Fiber Line 2	None	N/A	None	None	N/A	Boiler
Grafil	Sacramento, CA	Process Lines 31 & 32	36.4	lb/MMcf	None	95	ppmv	TO
Hexcel	West Valley City, UT	Production Lines 13 & 14	None	N/A	ULNB	89.83	tpy	TO & RTO
SGL Carbon	Evanston, WY	Line 2 oxidation ovens	8	lb/hr	None	0.37	lb/hr	RTO
		Line 2 carbonization furnaces	1.7	lb/hr	None	0.16	lb/hr	TO
	Moses Lake, WA	Oxidation oven	14.7	lb/hr	Proper operation	1.1	lb/hr	RTO
		Carbonization furnaces	1.81	lb/hr	Proper operation	0.27	lb/hr	TO
Toho Tenax	Rockwood, TN	Process Lines 3 & 4	20.1	lb/hr	None	2.97	lb/hr	RTO
Toray Industries	Decatur, AL	Mfg Process CFA-1 & CFA-2	1882	ppm	LNB for TO	None	N/A	None
Zoltek Corp.	St. Charles, MO	Oxidation oven	1	lb/hr	GCP	2	lb/hr	RTO
	Abilene, TX	Low- & high-temperature furnaces	2.5	lb/hr	None	0.12	lb/hr	TO

Table 14 presents the RBLC results for NH_3.

Table 14. RBLC Results for NH_3					
Facility	**Location**	**Emission Unit**	**NH_3 Limit**	**NH_3 Units**	**NH_3 Control**
Cytec	Rock Hill, SC	Oxidation ovens	None	N/A	None

Table 14. RBLC Results for NH_3					
Facility	Location	Emission Unit	NH_3 Limit	Units	Control
		Pre-carb & carbonization ovens	None	N/A	None
	Greenville, SC	Carbon Fiber Line 1	None	N/A	None
		Carbon Fiber Line 2	None	N/A	None
Grafil	Sacramento, CA	Process Lines 31 & 32	None	N/A	None
Hexcel	West Valley City, UT	Production Lines 13 &14	None	N/A	None
SGL Carbon	Evanston, WY	Line 2 oxidation ovens	None	N/A	None
		Line 2 carbonization furnaces	0.5	lb/hr	None
	Moses Lake, WA	Oxidation oven	0.112	lb/hr	RTO
		Carbonization furnaces	0.13	lb/hr	TO
Toho Tenax	Rockwood, TN	Process Lines 3 & 4	1.54	lb/hr	RTO
Toray Industries	Decatur, AL	Mfg Process CFA-1 & CFA-2	None	N/A	None
Zoltek Corp.	St. Charles, MO	Oxidation oven	None	N/A	None
	Abilene, TX	Low- & high-temperature furnaces	None	N/A	None

7.3. Emission Units Subject to BACT

There are eight process steps per line. They are: feed and pretension; combined oxidation; low- and high-temp carbonization; surface treatment; sizing; winding and packaging; emergency generators and fire water pump engine; and shutdown bypass stacks. There are no measurable emissions from the feed and pretension; surface treatment; sizing; and winding and packaging operations. Emissions come from the three points per line; ovens and furnaces, main stacks; stacks above each oxidation oven for Shutdown Mode vented emissions; and the 2937 bhp emergency generators and fire water pump engine.

7.3.1. BACT for Oxidation Ovens and Carbonization Furnaces

The purpose of the oxidation ovens is to oxidize the PAN feedstock. The pollutants emitted from the ovens and furnaces include NO_X, particulate matter (PM), PM smaller than 10 microns in diameter/particulate matter smaller than 2.5 microns in diameter (PM_{10}/$PM_{2.5}$), sulfur dioxide (SO_2), VOCs, CO, and TAPs.

7.3.1.1. BACT for NO_X

The potential control technologies for NO_X include:

- SCR
- Selective Non-Catalytic Reduction (SNCR)
- Flue Gas Recirculation (FGR)

- Minimized Oxidation Temperature
- Good Combustion Practice/Proper Operation

The oxidation ovens and low- and high-temperature carbonization process occur separately in series. The energy to heat these units up is electrical-based and no NO_X is generated by the combustion of fuel. Thermal NO_X, however, is generated from these processes.

SGLACF presented a case that FGR and minimized oxidation temperature were technically infeasible because they would compromise the effectiveness of the control device. SCR and SNCR were determined to be technically feasible but are cost prohibitive. NO_X control options are presented in Table 15.

Table 15. NO_X Control Options

Technology	Removal Efficiency	Cost/Ton of Pollutant Removed	Selected as BACT? (Yes or No)
SCR	70%-80%	$39,000	No
SNCR	30%-50%	≥ $65,000	No
Proper operation	0%	Baseline	Yes

An SCR unit will reduce NO_X from the oxidation ovens by approximately 80 percent over uncontrolled NO_X emissions. The carbonization furnaces are reducing the generation of NO_X by lowering the operating temperature of the TO unit (creating less thermal NO_X) in a process called water injection. Approximately 1.2 gallons of water are injected into each TO each minute. Water injection has been determined to be BACT for controlling NO_X emissions from the furnace/TO.

Ecology maintains that BACT for NO_X emissions from the ovens/RTO is proper operation. BACT for controlling NO_X emissions from the furnaces is water injection to the TO. Combined stack emissions of NO_X emissions must not exceed a 17.9 pounds per hour averaged over one hour. This combined limit satisfies BACT for this emission unit.

It is important to point out that SGLACF is installing and operating six SCR units (one for Lines 3–6). They will not be installing SCR units on Lines 7–10. The SCR units have not been determined to be BACT but they satisfy the BACT requirement.

SGLACF proposed, and Ecology agrees, that Proper Operation and water injection to the TO is BACT for controlling NO_X emissions from the oxidation and carbonization processes, respectively.

7.3.1.2. BACT for PM, PM_{10}, and $PM_{2.5}$

Filterable and condensable emissions are generated by the oxidation and carbonization processes that take place in the oxidation ovens and carbonization furnaces. Additionally, condensable PM_{10}/$PM_{2.5}$ is generated during fuel combusted in the RTO and TO and VOCs that are not combusted by the RTOs and TOs. SGLACF proposed to treat all the PM_{10} and $PM_{2.5}$ as if it were $PM_{2.5}$. This may slightly overestimate emissions of the PM_{10} fraction, but being conservative is acceptable in permitting a new or modified source.

A search of permits issued to similar facilities yielded the following as potential control techniques for PM, PM_{10}, and $PM_{2.5}$:

- Electrostatic Precipitator (ESP)
- Baghouse/fabric filter
- Venturi scrubber
- Proper Operation

No instance of an ESP or Venturi scrubber being used to reduce PM_{10}/$PM_{2.5}$ emissions from an oxidation oven or carbonization furnace was found. Two instances of a baghouse being used were found. One of the baghouse applications is downstream of an RTO used to reduce VOCs from an oxidation oven at a facility in Utah (Hexcel Corporation), which is located in a PM_{10} and $PM_{2.5}$ nonattainment area. The other baghouse application is downstream of the TO used to reduce VOC emissions from a high-temperature carbonization furnace at a facility in California (Grafil, Inc.), which is also located in a PM_{10} and $PM_{2.5}$ nonattainment area. The permit includes a PM emission limit for the entire production line; there is no PM emission limit specific to the baghouse.

Despite the lack of evidence that these control alternatives have been commonly employed to reduce PM emissions from RTOs and TOs controlling VOCs from carbon fiber production line emission units, there is nothing to suggest that it would be technically infeasible to install an ESP, baghouse, or Venturi scrubber for that purpose. Additionally, the cost per ton of pollutant removed is in excess of $100,000. The use of Good Combustion Practices is the most common PM control, and is considered the baseline alternative. PM_{10}/$PM_{2.5}$ control options are presented in Table 16.

Table 16. PM_{10}/$PM_{2.5}$ Control Options

Technology	Removal Efficiency	Cost/Ton of Pollutant Removed	Selected as BACT? (Yes or No)
ESP	99%	$109,996	No
Baghouse/fabric filter	99%	$131,549	No
Venturi scrubber	90%	$212,948	No
Proper operation	0%	Baseline	Yes

SGLACF proposed, and Ecology agrees, that Proper Operation is BACT for controlling PM, PM_{10}, and $PM_{2.5}$ emissions from the oxidation and carbonization processes.

7.3.1.3. BACT for SO_2

SO_2 emission rates are typically determined by the quantity of sulfur in a fuel or raw material. In this case, the raw material, PAN, does not contain sulfur, except as a trace impurity, and the primary source of SO_2 is the fuel used to heat the RTO and TO control devices.

A search of permits issued to similar facilities, as well as documents developed in support of the permitting process, including those operated by SGLACF, yielded the following as potential control techniques for SO_2:

- Acid-gas scrubber
- Low-sulfur fuel

While there are no instances of an acid-gas scrubber being used to reduce SO_2 emissions from a TO or RTO, there is no indication that such an application would be technically feasible. Nearly all permits indicate that natural gas is the primary fuel for TOs and RTOs, and some specifically require that it be the only fuel used to supplement the off-gas from the oven or furnace. In some cases, propane is also allowed as a fuel. Additionally, the cost per ton of pollutant removed is in excess of $140,000. The use of low-sulfur fuel and Proper Operation is considered the baseline alternative. SO_2 control options are presented in Table 17.

Table 17. SO_2 Control Options

Technology	Removal Efficiency	Cost/Ton of Pollutant Removed	Selected as BACT? (Yes or No)
Acid-gas scrubber	90%-95%	$145,000	No
Low-sulfur fuel/proper operation	0%	Baseline	Yes

SGLACF proposed, and Ecology agrees, that low-sulfur fuel/Proper Operation is BACT for controlling SO_2 emissions from the oxidation and carbonization processes.

7.3.1.4. BACT for VOCs, CO, and TAPs

VOC, CO, and volatile TAP emissions are generally the result of incomplete fuel combustion. However, in the case of oxidation ovens and furnaces at carbon fiber manufacturing facilities, low-molecular-weight VOCs, CO, and volatile TAPs, including NO_2, acrolein, acrylonitrile, ammonia, ammonium sulfate, ammonium bisulfate, arsenic, benzene, beryllium, bromomethane, 1,3-Butadiene, cadmium, carbon disulfide, chloromethane, chromium VI, cobalt, copper, dichlorobenzene, dichloromethane, formaldehyde, hexane, hydrogen cyanide, manganese, mercury, naphthalene, nickel, propylene, selenium, toluene, vanadium, vinyl acetate, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthrancene, indeno(1,2,3-cd)pyrene, 3-methylcholanthrene, and 7,12-dimethylbenz[a]anthracene are generated during the oxidation process.

A search of permits issued to similar facilities, as well as documents developed in support of the permitting process, including those operated by SGLACF, yielded the following as potential control techniques for VOCs, CO, and TAPs.

- TO
- RTO
- Wet scrubber
- Cryogenic condenser
- Biological treatment

Similar facilities have used TOs and RTOs to reduce VOC, CO, and TAP emissions from oxidation ovens. TOs and RTOs are essentially similar technologies, but RTOs employ ceramic beds to recover heat from the exhaust and reduce supplemental fuel use. Both TOs and RTOs are considered technically feasible for control of VOCs, CO, and TAPs generated by oxidation ovens at carbon fiber manufacturing facilities. Wet scrubbing, cryogenic condensation, and biological treatment were evaluated as potential control alternatives during the permitting of Lines 1 and 2, and were eliminated from consideration due to the creation of a waste stream with large concentrations of HCN and NH_3. These control techniques have been eliminated from consideration in BACT analyses for reasons such as susceptibility to plugging as a result of substances that are precipitated at lower temperatures. VOC, CO, and TAP control options are presented in Table 18.

Table 18. VOC, CO, and TAP Control Options

Technology	Removal Efficiency	Cost/Ton of Pollutant Removed	Selected as BACT? (Yes or No)
RTO/TO	80%-99%	Unknown	Yes
No control	0%	Baseline	No

SGLACF proposed, and Ecology agrees, that use of an RTO/TO and Proper Operation is BACT for controlling emissions of VOCs, CO, and TAPs from the oxidation and carbonization processes.

7.3.2. BACT for Diesel-Fuelled Compression/Ignition Engines Powering Emergency Equipment

Lines 3–10 will each have a dedicated emergency generator that, in case of a power outage, will enable the partially oxidized or carbonized product to continue moving through the ovens and furnaces and reduce the risk of off-gas collecting and catching fire. With regard to NO_X

emission abatement, the ranking of the technically feasible options is straightforward. The use of SCR offers the highest potential level of control for the proposed diesel-fired emergency engines. For particulate, a diesel particulate filter is effective in reducing small particulate referred to as diesel engine exhaust particulate (DEEP).

SGLACF has offered to install EPA Tier IV final compliant engines. Emission limits for Tier IV engines are identified in 40 CFR 1039.101, Table 1. Because these numbers are very low, Ecology will require particulate testing of these engines to ensure the proposed emission limits are achieved.

SGLACF proposed, and Ecology agrees, that proper operation and ultra low sulfur diesel onroad fuel is BACT for controlling emissions of NO_X and DEEP emissions from the diesel-fuelled compression/ignition engines powering emergency equipment. SGLACF's offer to install Tier IV final engines with SCR to control NO_X and a diesel particulate filter to control PM is an SGLACF decision. Therefore, it is not considered BACT for the diesel engines. The fire water pump engine will not include the Tier IV exhaust after-treatment.

BACT for controlling the other pollutants emitted from internal combustion engines powering emergency equipment has been determined to be Proper Operation. The fire water pump engine will not include the Tier 4 exhaust after-treatment.

7.4. Summary of BACT

Table 19 is a summary of the BACT determination for this project.

<table>
<tr><th colspan="4">Table 19. BACT Summary For Each Line</th></tr>
<tr><th>Process</th><th>Pollutant</th><th>BACT</th><th>Emission Limit</th></tr>
<tr><td rowspan="7">Combined oxidation & low- and high-temperature carbonization</td><td rowspan="4">CO</td><td rowspan="4">RTO/TO</td><td>Normal Operation
Lines 3–10
1.3 lb/hr</td></tr>
<tr><td>SCR Bypass
Lines 3–6
1.3 lb/hr</td></tr>
<tr><td>RTO Bypass
Lines 3–10
9.3 lb/hr</td></tr>
<tr><td>Shutdown
Lines 3–10
7.5 lb/hr</td></tr>
<tr><td rowspan="3">NO_X</td><td rowspan="3">For the ovens Proper Operation.
For the furnace/TO emissions is water injection.</td><td>Normal Operation
Lines 3–6
8.5 lb/hr</td></tr>
<tr><td>Normal Operation
Lines 7–10
17.9 lb/hr</td></tr>
<tr><td>SCR Bypass
Lines 3–6
17.9 lb/hr</td></tr>
</table>

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
			RTO Bypass Lines 3–10 8.5 lb/hr
			Shutdown Lines 3–6 8.5 lb/hr
			Shutdown Lines 7–10 17.9 lb/hr
	PM	Proper Operation	Normal Operation Lines 3–10 1.1 lb/hr
			SCR Bypass Lines 3–6 1.1 lb/hr
			RTO Bypass Lines 3–10 1.1 lb/hr
			Shutdown Lines 3–10 1.1 lb/hr
	$PM_{10}/PM_{2.5}$	Proper Operation	Normal Operation Lines 3–6 3.0 lb/hr
			Normal Operation Lines 7–10 2.0 lb/hr
			SCR Bypass Lines 3–6 2.0 lb/hr
			RTO Bypass Lines 3–10 2.0 lb/hr
			Shutdown Lines 3–6 3.0 lb/hr
			Shutdown Lines 7–10 2.0 lb/hr
	VOC	Proper Operation	Normal Operation Lines 3–10 1.7 lb/hr
			SCR Bypass Lines 3–6 1.7 lb/hr
			RTO Bypass Lines 3–10 8.6 lb/hr
			Shutdown Lines 3–10 7.1 lb/hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
	SO_2	Proper Operation	Normal Operation Lines 3–10 0.7 lb/hr
			SCR Bypass Lines 3–6 0.7 lb/hr
			RTO Bypass Lines 3–10 0.7 lb/hr
			Shutdown Lines 3–10 0.7 lb/hr
	NO_2	Proper Operation for ovens and water injection for TO.	Normal Operation Lines 3–6 6.8 lb/hr
			Normal Operation Lines 7–10 14.32 lb/hr
			SCR Bypass Lines 3–6 14.32 lb/hr
			RTO Bypass Lines 3–10 6.8 lb/hr
			Shutdown Lines 3–6 6.8 lb/hr
			Shutdown Lines 7–10 14.32 lb/hr
	Acrylonitrile	Proper Operation	Normal Operation Lines 3–10 5.60E-03 lb/hr
			SCR Bypass Lines 3–6 5.60E-03 lb/hr
			RTO Bypass Lines 3–10 0.17 lb/hr
			Shutdown Lines 3–10 0.136 lb/hr
	Ammonia	Proper Operation	Normal Operation Lines 3–10 3.0 lb/hr
			SCR Bypass Lines 3–6 0.6 lb/hr
			RTO Bypass Lines 3–10 9.6 lb/hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
			Shutdown Lines 3–10 10 lb/hr
	Arsenic	Proper Operation	Normal Operation Lines 3–10 3.70E-06 lb/hr
			SCR Bypass Lines 3–6 3.70 lb/hr
			RTO Bypass Lines 3–10 3.70E-06 lb/hr
			Shutdown Lines 3–10 3.70E-06 lb/hr
	Benzene	Proper Operation	Normal Operation Lines 1–10 1.70E-04 lb/hr
			SCR Bypass Lines 3–6 1.70E-04 lb/hr
			RTO Bypass Lines 3–10 1.70E-04 lb/hr
			Shutdown Lines 3 – 10 1.70E-04 lb/hr
	Beryllium	Proper Operation	Normal Operation Lines 3–10 2.20E-07 lb/hr
			SCR Bypass Lines 3–10 2.20E-07 lb/hr
			RTO Bypass Lines 3–10 2.20E-07 lb/hr
			Shutdown Lines 3–10 2.20E-07 lb/hr
	Bromomethane	Proper Operation	Normal Operation Lines 3–10 1.80E-04 lb/hr
			SCR Bypass Lines 3–6 1.80E-04 lb/hr
			RTO Bypass Lines 3–10 1.80E-04 lb/hr
			Shutdown Lines 3–10 1.80E-04 lb/hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
	Cadmium	Proper Operation	Normal Operation Lines 3–10 2.10E-05 lb/hr
			SCR Bypass Lines 3–6 2.10E-05 lb/hr
			RTO Bypass Lines 3–10 2.10E-05 lb/hr
			Shutdown Lines 3–10 2.10E-05 lb/hr
	Carbon disulfide	Proper Operation	Normal Operation Lines 3–10 2.70E-03 lb/hr
			SCR Bypass Lines 3–6 2.70E-03 lb/hr
			RTO Bypass Lines 3–10 2.70E-03 lb/hr
			Shutdown Lines 3–10 2.70E-03 lb/hr
	Chloromethane	Proper Operation	Normal Operation Lines 3–10 6.20E-05 lb/hr
			SCR Bypass Lines 3–6 6.20E-05 lb/hr
			RTO Bypass Lines 3–10 6.20E-05 lb/hr
			Shutdown Lines 3–10 6.20E-05 lb/hr
	ChromiumVI	Proper Operation	Normal Operation Lines 3–10 1.00E-06 lb/hr
			SCR Bypass Lines 3–6 1.00E-06 lb/hr
			RTO Bypass Lines 3–10 1.00E-06 lb/hr
			Shutdown Lines 3–10 1.00E-06 lb/hr
	Cobalt	Proper Operation	Normal Operation Lines 3–10 1.60E-06 lb/hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
			SCR Bypass Lines 3–6 1.60E-06 lb/hr
			RTO Bypass Lines 3–10 1.60E-06 lb/hr
			Shutdown Lines 3–10 1.60E-06 lb/hr
	Copper	Proper Operation	Normal Operation Lines 3–10 1.60E-05 lb/hr
			SCR Bypass Lines 3–6 1.60E-05 lb/hr
			RTO Bypass Lines 3–10 1.60E-05 lb/hr
			Shutdown Lines 3–10 1.60E-05 lb/hr
	Dichlorobenzene	Proper Operation	Normal Operation Lines 3–10 2.20E-05 lb/hr
			SCR Bypass Lines 3–6 2.20E-05 lb/hr
			RTO Bypass Lines 3–10 2.20E-05 lb/hr
			Shutdown Lines 3–10 2.20E-05 lb/hr
	Dichloromethane	Proper Operation	Normal Operation Lines 3–10 5.90E-07 lb/hr
			SCR Bypass Lines 3–6 5.90E-07 lb/hr
			RTO Bypass Lines 3–10 5.90E-07 lb/hr
			Shutdown Lines 3–10 5.90E-07 lb/hr
	Formaldehyde	Proper Operation	Normal Operation Lines 3–10 1.40E-03 lb/hr
			SCR Bypass Lines 3–6 1.40E-03 lb/hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
			RTO Bypass Lines 3–10 1.40E-03 lb/hr
			Shutdown Lines 3–10 1.40E-03 lb/hr
	Hexane	Proper Operation	Normal Operation Lines 3–10 2.80E-02 lb/hr
			SCR Bypass Lines 3–6 2.80E-02 lb/hr
			RTO Bypass Lines 3–10 2.80E-02 lb/hr
			Shutdown Lines 3–10 2.80E-02 lb/hr
	Hydrogen Cyanide	Proper Operation	Normal Operation Lines 3–10 1.40 lb/hr
			SCR Bypass Lines 3–6 1.40 lb/hr
			RTO Bypass Lines 3–10 30.0 lb/hr
			Shutdown Lines 3–10 24.0 lb/hr
	Manganese	Proper Operation	Normal Operation Lines 3–10 7.10E-06 lb/hr
			SCR Bypass Lines 3–6 7.10E-06 lb/hr
			RTO Bypass Lines 3–10 7.10E-06 lb/hr
			Shutdown Lines 3–10 7.10E-06 lb/hr
	Mercury	Proper Operation	Normal Operation Lines 3–10 4.90E-06 lb/hr
			SCR Bypass Lines 3–6 4.90E-06 lb/hr
			RTO Bypass Lines 3–10 4.90E-06 lb/hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
			Shutdown Lines 3–10 4.90E-06 lb/hr
	Naphthalene	Proper Operation	Normal Operation Lines 3–10 1.10E-05 lb/hr
			SCR Bypass Lines 3–6 1.10E-05 lb/hr
			RTO Bypass Lines 3–10 1.10E-05 lb/hr
			Shutdown Lines 3–10 1.10E-05 lb/hr
	Nickel	Proper Operation	Normal Operation Lines 3–10 3.90E-05 lb/hr
			SCR Bypass Lines 3–6 3.90E-05 lb/hr
			RTO Bypass Lines 3–10 3.90E-05 lb/hr
			Shutdown Lines 3–10 3.90E-05 lb/hr
	Propylene	Proper Operation	Normal Operation Lines 3–10 1.10E-04 lb/hr
			SCR Bypass Lines 3–6 1.10E-04 lb/hr
			RTO Bypass Lines 3–10 1.10E-04 lb/hr
			Shutdown Lines 3–10 1.10E-04 lb/hr
	Selenium	Proper Operation	Normal Operation Lines 3–10 4.50E-07 lb/hr
			SCR Bypass Lines 3–6 4.50E-07 lb/hr
			RTO Bypass Lines 3–10 4.50E-07 lb/hr
			Shutdown Lines 3–10 4.50E-07 lb/hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
	Toluene	Proper Operation	Normal Operation Lines 3–10 2.60E-04 lb/hr
			SCR Bypass Lines 3–6 2.60E-04 lb/hr
			RTO Bypass Lines 3–10 2.60E-04 lb/hr
			Shutdown Lines 3–10 2.60E-04 lb/hr
	Vanadium	Proper Operation	Normal Operation Lines 3–10 4.30E-05 lb/hr
			SCR Bypass Lines 3–6 4.30E-05 lb/hr
			RTO Bypass Lines 3–10 4.30E-05 lb/hr
			Shutdown Lines 3–10 4.30E-05 lb/hr
	Vinyl Acetate	Proper Operation	Normal Operation Lines 3–10 5.10E-03 lb/hr
			SCR Bypass Lines 3–6 5.10E-03 lb/hr
			RTO Bypass Lines 3–10 5.10E-03 lb/hr
			Shutdown Lines 3–10 5.10E-03 lb/hr
	Benz(a)anthracene	Proper Operation	Normal Operation Lines 3–10 3.40E-08 lb/hr
			SCR Bypass Lines 3–6 3.40E-08 lb/hr
			RTO Bypass Lines 3–10 3.40E-08 lb/hr
			Shutdown Lines 3–10 3.40E-08 lb/hr
	Benzo(a)pyrene	Proper Operation	Normal Operation Lines 3–10 2.20E-08 lb/hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
			SCR Bypass Lines 3–6 2.20E-08 lb/hr
			RTO Bypass Lines 3–10 2.20E-08 lb/hr
			Shutdown Lines 3–10 2.20E-08 lb/hr
	Benzo(b)fluoranthene	Proper Operation	Normal Operation Lines 3–10 3.40E-08 lb/hr
			SCR Bypass Lines 3–6 3.40E-08 lb/hr
			RTO Bypass Lines 3–10 3.40E-08 lb/hr
			Shutdown Lines 3–10 3.40E-08 lb/hr
	Benzo(k)fluoranthene	Proper Operation	Normal Operation Lines 3–10 3.40E-08 lb/yr
			SCR Bypass Lines 3–6 3.40E-08 lb/hr
			RTO Bypass Lines 3–10 3.40E-08 lb/hr
			Shutdown Lines 3–10 3.40E-08 lb/hr
	Chrysene	Proper Operation	Normal Operation Lines 3–10 3.40E-08 lb/hr
			SCR Bypass Lines 3–6 3.40E-08 lb/hr
			RTO Bypass Lines 3–10 3.40E-08 lb/hr
			Shutdown Lines 3–10 3.40E-08 lb/hr
	Dibenzo(a,h)anthrancene	Proper Operation	Normal Operation Lines 3–10 2.20E-08 lb/hr
			SCR Bypass Lines 3–6 2.20E-08 lb/hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
			RTO Bypass Lines 3–10 2.20E-08 lb/hr
			Shutdown Lines 3–10 2.20E-08 lb/hr
	Indeno(1,2,3-cd)pyrene	Proper Operation	Normal Operation Lines 3–10 3.40E-08 lb/hr
			SCR Bypass Lines 3–6 3.40E-08 lb/hr
			RTO Bypass Lines 3–10 3.40E-08 lb/hr
			Shutdown Lines 3–10 3.40E-08 lb/hr
	3-Methylcholanthrene	Proper Operation	Normal Operation Lines 3–10 3.40E-08 lb/hr
			SCR Bypass Lines 3–6 3.40E-08 lb/hr
			RTO Bypass Lines 3–10 3.40E-08 lb/hr
			Shutdown Lines 3–10 3.40E-08 lb/hr
	7,12-Dimethylbenz[a]anthracene	Proper Operation	Normal Operation Lines 3–10 3.00E-07 lb/hr
			SCR Bypass Lines 3–6 3.00E-07 lb/hr
			RTO Bypass Lines 3–10 3.00E-07 lb/hr
			Shutdown Lines 3–10 3.00E-07 lb/hr
Diesel engines	NO_X	Proper Operation and use of ULSD. Since engine emission limits are intentionally low, they are considered to be other.	0.5 g/hp-hr
	$PM_{10}/PM_{2.5}$	Proper Operation and use of ULSD. Since engine emission limits	0.01 g/hp-hr

Table 19. BACT Summary For Each Line			
Process	**Pollutant**	**BACT**	**Emission Limit**
		are intentionally low, they are considered to be other.	
	VOC	Proper Operation	0.03 g/hp-hr
	CO	Proper Operation. Since engine emission limits are intentionally low, they are considered to be other.	0.11 g/hp-hr
	SO_2	Proper Operation	1.2×10^{-5} lb/hp-hr
	NO_2	Proper Operation	0.4 g/hp-hr
	Acetaldehyde	Proper Operation	4.83×10^{-4} lb/hr
	Acrolein	Proper Operation	1.5×10^{-4} lb/hr
	Benzene	Proper Operation	0.015 lb/hr
	DEEP	Proper Operation	0.01 g/hp-hr
	Formaldehyde	Proper Operation	0.0015 lb/hr
	Naphthalene	Proper Operation	0.0027 lb/hr
	Propylene	Proper Operation	0.054 lb/hr
	Toluene	Proper Operation	0.0054 lb/hr
	Xylenes	Proper Operation	0.0037 lb/hr
	Benz(a)anthracene	Proper Operation	1.19×10^{-5} lb/hr
	Benzo(a)pyrene	Proper Operation	4.93×10^{-6} lb/hr
	Benzo(b)fluoranthene	Proper Operation	2.13×10^{-5} lb/hr
	Benzo(k)fluoranthene	Proper Operation	4.18×10^{-6} lb/hr
	Chrysene	Proper Operation	2.93×10^{-5} lb/hr
	Dibenzo(a,h)anthrancene	Proper Operation	6.64×10^{-6} lb/hr
	Indeno(1,2,3-cd)pyrene	Proper Operation	7.94×10^{-6} lb/hr
FWP Engine	NOX	Proper Operation	2.0 g/hp-hr
	$PM_{10}/PM_{2.5}$	Proper Operation	1.94E-02 lb/MMBtu
	VOC	Proper Operation	1.0 g/bhp/hr

8. AMBIENT AIR QUALITY ANALYSIS

8.1. Modeling Methodology

SGLACF's consultant, ENVIRON, used the EPA recommended AERMOD (Version 14134) air dispersion model. AERMET (Version 14134) was based upon the meteorological data available from the National Weather Service (NWS) surface station located at the Grant County International Airport and a NWS upper air station located in Spokane, Washington. The dispersion modeling techniques used to simulate transport and diffusion require an hourly meteorological database. Therefore, in addition to using the hourly NWS meteorological data, 1-minute wind speed and wind direction data from the Grant County International Airport, ENVIRON used using the AERMINUTE preprocessor (Version 11325) to resolve calm and variable wind conditions.

8.2. Criteria Pollutant Concentrations

Table 20 presents the criteria pollutants against the modeling Significant Impact Levels (SILs).

Table 20. SIL Analysis			
Criteria Pollutant	Avg. Period	Max Project Concentration ($\mu g/m^3$)	SIL ($\mu g/m^3$)
CO	1-hr	114.1	2,000
	8-hr	96.6	500
NO_2	1-hr	110.9	7.5
	annual	5.5	1
PM_{10}	24-hr	10.7	5
$PM_{2.5}$	24-hr	9.6	1.2
	annual	1.9	0.3
SO_2	1-hr	6.9	7.8
	3-hr	6.4	25
	24-hr	3.4	5
	annual	0.5	1

The emissions of NO_2, PM_{10}, and $PM_{2.5}$ exceed the SIL. Therefore, the emissions will undergo a NAAQS analysis.

8.3. Increment

At the time of submittal of this permit application, the $PM_{2.5}$ minor source baseline date had not been triggered in the Eastern Washington-Northern Idaho Interstate Air Quality Control Region. When the application for this project was determined to be complete (September 15, 2014), the minor source baseline date was triggered.

The Eastern Washington-Northern Idaho Interstate Air Quality Control Region (AQCR 230) encompasses Adams, Asotin, Columbia, Garfield, Grant, Lincoln, Spokane, Whitman Benewah, Kootenai, Latah, Nez Perce, and Shoshone counties.

As indicated in Table 21, The NO_2 minor source baseline date was established in 1992. Although actual emissions are appropriate when evaluating increment consumption, SGLACF included potential annual NO_X emissions from industrial sources within 50 kilometers of the facility to evaluate annual NO_2 increment consumption. An additional conservative measure was to assume all regional sources consume NO_2 increment even though some of them were constructed prior to 1992 and would therefore not consume NO_2 increment. NO_X emissions do not result in concentrations that exceed the annual NO_2 increment.

Table 21. Increment Analysis			
Pollutant	Avg. Period	Maximum Modeled Concentration ($\mu g/m^3$)	Class II PSD Increment ($\mu g/m^3$)
NO_2	annual	5.8	25
PM_{10}	24-hr	8.97	30
$PM_{2.5}$	24-hr	8.97	9.0
	annual	1.9	4.0

Project emissions do not result in concentrations that exceed allowable PSD increments.

8.4. NAAQS Analysis

Facility-wide modeling results and background concentrations presented in Table 22 indicate NO_2, PM_{10}, and $PM_{2.5}$ design concentrations plus background concentrations are below the applicable NAAQS at all receptor locations.

Table 22. NAAQS Analysis					
Criteria Pollutant	Avg. Period	Maximum Concentration (Facility) ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	Standard ($\mu g/m^3$)
NO_2	1-hr	89.8	16.0	105.8	188
	annual	6.4	2.8	9.2	100
PM_{10}	24-hr	11.4	92	103.4	150
$PM_{2.5}$	24-hr	11.8	19.4	31.2	35
	annual	3.3	6.5	9.8	12

Emissions of all pollutants are below their NAAQs and no further analysis is necessary.

8.5. TAP Analysis

8.5.1. SQER Analysis

Table 23 compares the project’s proposed emissions to the SQERs.

Table 23. SQER Analysis				
Pollutant	**Avg. Period**	**Max Emissions (lb/avg. period)**	**SQER (lb/avg. period)**	**Emissions Above SQER? (Yes or No)**
CO	1-hr	23.7	50.40	No
SO_2	1-hr	5.56	1.45	Yes
NO_2	1-hr	127.0	1.030	Yes
Acrolein	24-hr	0.048	0.008	Yes
Acrylonitrile	annual	408.3	0.662	Yes
Ammonia	24-hr	594.0	9.310	Yes
Ammonium sulfate	1-hr	12	0.263	Yes
Ammonium bisulfate	1-hr	12	0.363	Yes
Arsenic	annual	0.262	0.058	Yes
Benzene	annual	14.1	6.620	Yes
Beryllium	annual	0.016	0.080	No
Bromomethane	24-hr	0.034	0.657	No
1,3-Butadiene	annual	0.1	1.130	No
Cadmium	annual	1.4	0.046	Yes
Carbon disulfide	24-hr	0.5	105.000	No
Chloromethane	24-hr	0.012	11.800	No
Chromium VI	annual	0.073	0.001	Yes
Cobalt	24-hr	3.0E-04	0.013	No
Copper	1-hr	1.3E-04	0.219	No
DEEP	annual	5.7	0.639	Yes
Dichlorobenzene	annual	1.57	17.400	No
Dichloromethane	annual	0.048	192.000	No
Formaldehyde	annual	101.6	32.0	Yes
Hexane	24-hr	5.5	92.000	No
Hydrogen cyanide	24-hr	310.4	1.180	Yes
Manganese	24-hr	0.0014	0.005	No
Mercury	24-hr	0.00093	0.012	No
Naphthalene	annual	1.2	5.640	No
Nickel	annual	2.7	NO ASIL	N/A
Propylene	24-hr	1.305	394.000	No
Selenium	24-hr	8.6E-05	2.630	No
Toluene	24-hr	0.19	657.000	No
Vanadium	24-hr	0.0082	0.026	No
Vinyl acetate	24-hr	0.98	26.300	No
Benz(a)anthracene	annual	0.004	1.740	No
Benzo(a)pyrene	annual	0.0022	0.174	No
Benzo(b)fluoranthene	annual	0.0053	1.740	No
Benzo(k)fluoranthene	annual	0.0029	1.740	No

Table 23. SQER Analysis				
Pollutant	Avg. Period	Max Emissions (lb/avg. period)	SQER (lb/avg. period)	Emissions Above SQER? (Yes or No)
Chrysene	annual	0.0063	17.400	No
Dibenzo(a,h)anthrancene	annual	0.0025	0.160	No
Indeno(1,2,3-cd)pyrene	annual	0.0034	0.031	No
3-Methylcholanthrene	annual	0.0024	0.031	No
7,12-Dimethylbenz[a]anthracene	annual	0.021	0.003	Yes

Emissions of SO_2, NO_2, acrolein, acrylonitrile, ammonia, ammonium sulfate, ammonium bisulfate, arsenic, benzene, cadmium, chromiumVI, DEEP, formaldehyde, hydrogen cyanide, and 7,12-dimethylbenz[a]anthracene exceed the SQER. Therefore, they were modeled.

8.5.2. ASIL Analysis

Table 24 compares the pollutants that exceeded the SQER to their ASILs.

Table 24. ASIL Analysis				
Pollutant	Avg. Period	Max Modeled Concentration (µg/m^3)	ASIL (µg/m^3)	Emissions Above ASIL (Yes or No?)
SO_2	1-hr	7.2	660	No
NO_2	1-hr	122.4	470	No
Acrolein	24-hr	0.0237	0.06	No
Acrylonitrile	lb/yr	0.00436	0.00345	Yes
Ammonia	24-hr	13.8	70.8	No
Ammonium sulfate	1-hr	16.4	120	No
Ammonium bisulfate	1-hr	16.4	120	No
Arsenic	annual	2.7×10^{-6}	3.03×10^{-4}	No
Benzene	annual	2.4×10^{-4}	0.0345	No
Cadmium	annual	1.5×10^{-5}	0.000238	No
Chromium VI	annual	7.6×10^{-7}	6.67×10^{-6}	No
DEEP	annual	0.00038	0.0033	No
Formaldehyde	annual	0.0011	0.167	No
Hydrogen cyanide	24-hr	8.1	9	No
7,12-Dimethylbenz[a]anthracene	annual	2.2×10^{-7}	1.41×10^{-5}	No

All toxics except acrylonitrile are below their appropriate ASILs. However, if the project were only to include Lines 3–7, the maximum model-predicted concentration of acrylonitrile would be

0.00314 μg/m^3, which is below the 0.00345 μg/m^3 ASIL. The exceedance of acrylonitrile will occur once Line 8 is operational. SGLACF intends to purchase the impacted property. The application also notes that SGLACF has no Board of Directors authorization for expansion beyond Line 5, which is currently under construction; Lines 6–10 are included in the application to prevent the question of aggregation of projects should they be approved in the next few years. The Approval Order requires SGLACF to purchase the land where the exceedance has been modeled to occur as shown in the figures below for each project as shown in the Table 25.

Table 25. Property Coordinates

UTM Property Corners (Meters)					Property Dimensions (Feet)	
North of Site						
	Northwest	Northeast	Southeast	Southwest	North-South	East-West
With Line 8	327169, 5231073	327226, 5231073	327226, 5231065	327169, 5231068	24	188
With Lines 8 & 9	327091, 5231126	327297, 5231126	327298, 5231062	327090, 5231071	210	680
With Lines 8–10	327048, 5231173	327372, 5231172	327372, 5231058	327048, 5231073	376	1064
South of Site						
With Line 8	N/A	N/A	N/A	N/A	N/A	N/A
With Lines 8 & 9	N/A	N/A	N/A	N/A	N/A	N/A
With Lines 8–10	326961, 5230448	327037, 5230446	327037, 5230415	326961, 5230415	110	250

Figure 2. Land needed for Line 8 due to the exceedance of acrylonitrile

Figure 3. Land needed for Lines 8–9 due to the exceedance of acrylonitrile

Figure 4. Land needed for Lines 8–10 due to the exceedance of acrylonitrile

9. CONCLUSION

The project will have no significant adverse impact on air quality. The Washington State Department of Ecology finds that the applicant, SGLACF, has satisfied all requirements for NSR.

For more information contact:

Richard B. Hibbard, P.E.
Washington State Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600
(360) 407-6896
richard.hibbard@ecy.wa.gov

10. LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
$\mu g/m^3$	micrograms per cubic meter
ASIL	Acceptable Source Impact Level
BACT	Best Available Control Technology
bhp	brake horsepower
CERMS	Continuous Emission Rate Monitoring System
CO	carbon monoxide
DEEP	diesel engine exhaust particulate
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ESP	Electrostatic Precipitator
FGR	Flue Gas Recirculation
g/dscf	grains per dry standard cubic foot
HAP	hazardous air pollutant
HCN	hydrogen cyanide
hp	horsepower
hr	hour(s)
lb	pound(s)
MCPU	Miscellaneous Organic Chemical Manufacturing Process Units
MMBtu	million British thermal units
NAAQS	National Ambient Air Quality Standard
NAICS	North American Industry Classification System
NESHAP	National Emission Standards for Hazardous Air Pollutants
NH_3	ammonia
NOC	Notice of Construction
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NSPS	New Source Performance Standards
NSR	New Source Review
NWS	National Weather Service

PAN	polyacrylonitrile
PM	particulate matter
PM_{10}	particulate matter smaller than 10 microns in diameter
$PM_{2.5}$	particulate matter smaller than 2.5 microns in diameter
ppm	parts per million
ppmv	parts per million by volume
ppmvd	parts per million by volume, dry
PSD	Prevention of Significant Deterioration
RACT	Reasonably Available Control Technology
RCW	Revised Code of Washington
RICE	Reciprocating Internal Combustion Engines
RTO	regenerative thermal oxidizer
SCR	selective catalytic reduction
SIL	Significant Impact Level
SNCR	Selective Non-Catalytic Reduction
SGLACF	SGL Automotive Carbon Fiber
SIC	Standard Industrial Classification
SO_2	sulfur dioxide
TAP	toxic air pollutant
TO	thermal oxidizer
tpy	tons per year
TRE	Total Resource Effectiveness
TSD	Technical Support Document
WAC	Washington Administrative Code